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Voice processors stand alone no more
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ABSTRACT: Multiapplication voice processing systems are evaluated. Vendors
included on the short list were selected based on their ability to provide
systems that deliver multiple applications, such as voice mail, voice
response, and fax processing. Some also offer other important features,
such as unified messaging capabilities. These criteria reflect the needs of
users with multivendor enterprise networks. The short list systems are:
AT&T Global Business Communication Systems' Ovation Voice Processing System
and Conversant Voice Information families; Centigram Communications Corp.'s
Adaptive Information Processing Platform; Octel Communications Corp.'s
voice processing product family; VMX Inc.'s VMX 200 and VMX 300.

TEXT: Benefiting from a lesson learned by their relatives in the data
field, voice processing vendors are integrating applications that once ran
on separate units under a since system umbrella.

Just as punch card tabulators and standalone word processors gave way to
computers capable of running different types of applications, units once
limited to offering only voice mail or interactive voice response (IVR) are
being recast as multiapplication voice processors. These processors treat
digitized voice as another form of data that can be stored, retrieved,
sorted, indexed, copied, converted to different formats or played back as
analog speech.

Processing digitized voice as chunks of data enables a mix of voice
applications running on proprietary-, minicomputer-or personal
computer-based platforms to share a common set of hardware resources. For
instance, voice mail, automated attendant, audiotext and IVR applications
can all make use of the same voice processing and carrier network interface
boards as well as other peripherals such as host interface boards, hard
disks and administrative consoles.

Some products use extra space in a private branch exchange chassis as a
voice processing platform or use mainframes connected to a PBX to run voice
processing applications.
Multiapplication voice processors also make it possible for users to gain
increased functionality by purchasing add-on boards and software. This
add-on capability paves the way for users to easily add emerging
applications such as **speech recognition** that enables callers to
enter commands by speaking them and text-to-speech technology that enables
voice processors to read text files to callers.

Likewise, users can purchase add-on fax processing equipment that enables
callers to use a telephone keypad to automate the sending and receiving of
facsimile messages, initiate a fax broadcast or request a fax of a stored
document.

On a related front, the emergence of unified messaging interfaces is paving

the way for creation of voice processor-based mixed media mailboxes. Early implementations of unified messaging interfaces enable end users to get notification of new voice, electronic mail, fax messages from a telephone keypad or PC, as opposed to using a phone to get voice mail or a PC to pick up E-mail and checking a fax machine for incoming messages.

Unified messaging interfaces will also enable end users to enter commands on a telephone keypad or PC that redirect messages to an appropriate device for delivery. For instance, keypad commands can redirect fax messages to a nearby fax machine or E-mail messages to a text-to-speech board that will read the message to the end user (see story, page 58).

The emergence of multiapplication voice processors obviates the need for users to purchase stand-alone units that support separate applications. And studies from such research firms as Robins Press, Probe Research, Inc. and Frost & Sullivan Market Intelligence indicate users are indeed buying into the concept. For example, the studies show that while voice mail remains the most common voice processing application, it is increasingly being viewed as just one function of a much broader system platform.

With unified messaging interfaces now coming out, a multiplatform voice processor also paves the way for users to integrate all forms of messaging across the enterprise.

Key factors to consider in choosing a multiapplication voice processor are the system architecture and the breadth of applications the system can support.

Voice processors can be architected to run on a single platform in which individual processor boards are plugged into one or a series of interconnected buses and fall under the direction of a single operating system. Alternatively, a series of adjunct processors, each dedicated to running a single application, can be interconnected.

FROM HIGH TO LOW

Segmenting the voice processing market can be tricky. Most systems are designed for easy expansion, enabling low-end units to easily expand into the mid-range. Compounding the problem is the availability of networking schemes that allow multiple mid-range system chassis or even systems at remote sites to be strung together for even higher capacity.

In general, however, the very top of the market consists of units made exclusively for telephone companies and service bureaus. These systems sport proprietary, custom-made hardware that deliver anywhere from several hundred to more than 1,000 ports, much more capacity than large corporate users need. Products in this category often run from the hundreds of thousands to the millions of dollars and include Digital Sound Corp.'s Voiceserver, Octel Communications Corp.'s XC 1000 and Comverse Technology, Inc.'s Trilogue Infinity.

Large corporate users will find systems in the high-end to mid-range market better suited to meet their needs. Most systems in this market segment are built on top of proprietary hardware platforms, while a few make use of minicomputers. Systems falling into this end of the market include Octel's Aspen, AT&T Global Business Communication Systems' Ovation Voice Processing System and Conversant Voice Information System, Centigram Communications Corp.'s Adaptive Information Processing Platform and VMX, Inc.'s VMX 200 and VMX 300. They routinely support as many as 100 ports and a robust feature set similar to what is available on top-end systems.

High-end to mid-range products support a variety of vendor-provided hardware and application software modules, such as fax broadcasting and E-mail integration packages. Also offered are families of vertical and horizontal market applications that address specific business needs, such as an IVR program for bank account inquiry or a network help desk package. To help customize the programming of the systems' various features, system-specific application generators are also thrown into the pot.

Application generators are highly structured, menu-driven programs that enable users to create new or customize existing voice processing applications. They typically offer help menus, pull-down windows, a mouse and other programming aids and conveniences.

Products built on top of a proprietary platform are designed to seamlessly work within a telephony environment and support continuous operation, often providing more than 99% uptime and the ability to automatically restart themselves after a failure. Proprietary platforms are also built with multiple buses to provide for easy growth and support hot swappable parts, which enables users to change out failed boards for new ones without taking the system down.

Currently at the low-end of the market are systems based predominately on industry-standard, open-architected PC platforms supporting as many as 36 ports. While not yet as powerful as existing high-end to mid-range systems, PC platforms are quickly becoming the preferred choice.

Indeed, with new PCs continuously breaking benchmark records, the sheer processing power unleashed by the new generation of Intel Corp. 80486 and Pentium-based PCs is providing the most cost-effective platform for sophisticated voice applications. And that power will only increase as such new chips as the PowerPC developed by Apple Computer, Inc., IBM and Motorola, Inc., as well as Digital Equipment Corp.'s Alpha, gain a foothold in the market.

A majority of vendors already offer PC-based products. The sheer economy of PC technology along with availability of such components as voice boards--the heart of any voice processor--from several third-party suppliers is encouraging a steady crop of new vendors to enter the marketplace. Even end users are getting in on the act and building the own PC-based voice processors (see story, page 64.)

ARCHITECTURES

Products built on top of proprietary platforms fall into one of two broad architectural camps: one enables all components to be plugged into a single platform; the other calls for a series of application specific systems called adjunct processors--to be tethered to a central system unit.

VMX, Digital Sound and AT&T use the single platform approach, while Octel, Active Voice Corp. and Northern Telecom, Inc. have taken the adjunct processor route.

In the single platform approach, specialized circuit boards are plugged into a bus. Incoming calls received by network interface boards are passed off to voice boards, which digitize voice. Application programs such as voice mail or automated attendant then direct the digitized voice to peripherals needed to process the call. These products can be programmed to work with such stand-alone third-party systems as fax servers, but the trend among vendors is to build everything themselves and meld it into

their voice processors.

With an adjunct processor architecture, calls are received by a central unit, which then shuttles requests for information or application processing services across point-to-point links to processors designed to perform specific functions.

The single system architecture is better suited to support the emerging unified messaging concept because hardware resources and applications can be more tightly integrated if they are maintained under one roof. Systems built on top of the adjunct processor architecture can also support unified messaging but at the cost of more intricate, complicated programming than is required in a single platform architecture.

In the PC-based arena, products are typically offered from a single system platform. However, utilizing local-area network technology, a series of PC-based voice systems can be strung together to work in a client/server environment. Increasingly, applications running on one voice server are being designed to request services running on any other server on the LAN, including fax servers.
Some vendors offer networking features that link multiple voice processors at the same site or across remote sites. Networking features make it possible for voice messages to be forwarded among interconnected systems.

Voice processors across market segments provide a link to a company's PBX or Centrex service. Such a link enables message-waiting notifications to be passed from the voice processor to a user's extension and enables callers to return to an operator or dial another extension during a single phone call.

VOICE BOARDS

Aside from the architecture, a key factor to consider in choosing hardware is the type of voice board supported. While there is little difference in functionality among voice boards, there is a difference in who builds the boards and how they were built.

Vendors of high-end to mid-range products generally manufacture their own voice boards and all other components--everything from telephone network interface boards to operating systems and disk drives. These vendors often distribute voice board functionality across a multiboard set.
Creating multiboard sets gives proprietary voice board makers the benefit of putting physical network interfaces, tone detection circuitry, voice digitization and other functions on dedicated boards. This paves the way to have boards with, for example, very high-port density or random-access memory buffers that are optimized to perform specific functions such as retrieving stored voice from a disk as quickly as possible. It also makes for high reliability because the failure of one board will not bring the entire system down.

PC-based systems utilize third-party voice boards made by such companies as Dialogic Corp., Natural MicroSystems Corp. and Rhetorex, Inc. These products integrate most basic functions and some advanced functions on a single board. Dialogic provides boards with 4, 8,16 or 24 ports.

Rhetorex, which was recently purchased by VMX, has 2-, 4- and 24-port boards, while Natural MicroSystems has 2-, 4-, 8-, 16-, 24-, 30-, 48- and 60-port boards.

PC-based boards are also designed to published specifications, which

enables providers of fax, **speech recognition**, text-to-speech and other boards to make interoperable products. Third-party voice boards also work across PC expansion buses, which are created by plugging the boards into a standard PC bus and interconnecting them via a ribbon cable. Expansion buses speed the flow of traffic among voice processor boards.

Dialogic, which accounts for about 75% of the third-party voice board market, currently uses its PCM Expansion Bus (PEB) to interconnect voice processing boards.

The PEB is a time-division multiplexing bus that can support as many as 32 full-duplex calls simultaneously. The firm is developing its Signal Computing System Architecture (SCSA) bus that will increase call-handling capacity and provide the amount of bandwidth needed to support such up-and-coming applications as video messaging.

While it is unclear when the SCSA will be available, Dialogic will pit it against Natural MicroSystems' Alliance Generation bus, which supports boards with 60 ports. Alliance Generation is a follow-on to Natural MicroSystems' Multivendor Integration Protocol (MVIP) bus, which supports a PBX-like switching architecture capable of handling as many as 256 full-duplex calls simultaneously. Alliance Generation will also support the lower density port boards used with MVIP.
APPLICATION PROCESSING

Evaluating the hardware choices, while important, is only half the battle. An examination of the system and application software is just as critical.

Operation of all high-end products is controlled by proprietary, multitasking operating systems, usually based on Unix. PC-based platforms use industry standard operating systems such as DOS, OS/2 and Unix. As a rule of thumb, network managers should choose a multitasking operating system for obvious reasons.

The operating system orchestrates the execution of such applications as voice mail, automated attendant and IVR. Vendors are now adding fax processing and E-mail integration applications to the mix.

In today's market, it's hard to tell one voice-mail application from another, especially at the high end of the market where feature sets are robust. The majority of voice processing vendors got their start in voice mail and continue to offer important features. In particular, they offer on-line directories that enable callers to enter telephone keypad commands to look up someone's extension or return to an operator. They also enable callers to mark messages as urgent or priority and support various outdialing options, such as calling a message recipient's pager when a new message is left.

Some low-end products do not provide as full a feature set, largely because their vendors have choosen not to program them into the application. Essentially, users choosing these low-end products give up such robust features as urgent message marking and outdialing.

There is likewise not much difference in automated attendant applications, which automatically answer incoming calls and ask callers to use a telephone keypad to enter the extension number of the party they wish to reach or the number for another voice processing application.

Dytel Corp.'s Call Center Product pioneered the high-end to mid-range

market for automated attendants and was recently purchased by Syntellect, Inc. Cobotyx Corp., Inc. also got its start in the automated attendant market and continues to offer a robust product.

High-end automated attendant applications provide two important functions: call screening and an on-line directory.

With call screening, the automated attendant asks callers to speak their names before transferring the call to the desired extension and records those names. When the call is transferred, the called party can hear who is calling and can decide to take the call or not. Calls not taken can be routed to a secretary or to voice mail. System administrators define which extensions can have call screening, and end users can then define where unanswered calls are routed.

Automated attendants with an on-line directory feature enable callers to type in the name of the person they wish to reach in order to learn the extension. If an on-line directory is not provided or the caller is using a rotary phone, the system defaults to an operator if no command has been entered after a specified interval.

In addition, all automated attendants provide a dial zero for operator feature that enables callers to exit the automated attendant to speak with an operator. This is an especially important feature if the caller does not know the extension and an on-line directory is not provided.

IVR SUPPORT

Voice mail and automated attendant, while now basic, are enabling applications. Both paved the way for processing calls in a structured manner, a key attribute of IVR applications that support transaction processing by letting callers use the telephone keypad to enter, modify or retrieve data stored on host computers.

Mainly a function of high-end to mid-range products, **IVR** enables callers to **order** a product, verify airline flight departures or request a bank **account** balance. Prerecorded voice prompts or text-to-speech is used to communicate instructions to callers, confirm keypad entries and translate data from the computer into speech.

Supporting IVR requires the installation of host interface boards and terminal-emulation software that translates keypad commands to ones understood by the host computer. Most voice processors offering IVR support multiple host interfaces and host protocols.

High-end systems generally support all major host protocols including RS-232 asynchronous links to such computers as Tandem Computer, Inc.'s NonStop, Digital Equipment Corp. VAXes and even PCs. High-end products also commonly emulate IBM 3274 Cluster Controllers providing connection to IBM hosts and IBM 5252 Cluster Controllers providing a link to IBM System 36, System 38 and Application System/400 minicomputers.
Popular IVRs include AT&T Global Business Communication Systems' Conversant Voice Information System, Perception Technology's Vocom V, Periphonics Corp.'s VPS Series and Syntellect's Premier product family. Those products blazed a trail in IVR and were expanded to support other voice-processing applications.

Robust IVR applications can automatically log on to and off of host computers as calls require, automatically recover from a host failure, detect when the host is down and be able to keep the voice

processor-to-host link alive.

Unlike voice mail and automated attendant applications, IVR requires a bit of data software programming know-how. While voice mail and automated attendant applications can be readily loaded onto a voice processor and start running with little or no modification, IVR applications most often have to be programmed from the ground up and conform to host database management system rules. This programming requirement forces end users to be well schooled in host environments or seek help from outside sources.

Alternatively, a growing number of voice processor vendors provide easily customized off-the- shelf IVR applications for vertical markets. For instance, Apex Voice Communications, Inc.'s OmniVOX, Communications Specialists, Inc.'s ScriptWrite and Granada Systems Design, Inc.'s TelGEN products provide a library of prewritten applications that include bank account inquiry, data entry and order entry. These products also provide a set of application generation tools that enable users to customize the prewritten applications.

FAX PROCESSING

Another leading application is fax processing. Enabled by the installation of a fax processor board and associated software, fax processing makes it possible for callers to send and receive fax messages and documents by entering commands on a telephone keypad.

Fax processing capabilities are increasingly being integrated or combined with IVR, voice mail and other voice processor-based applications.

For instance, callers can respond to voice prompts asking them to select which of a series of stored documents they would like sent to their fax machines, a process known as fax-on-demand. A wide array of documents can be made available by fax-on-demand applications, including price lists, product information sheets, account statements, transaction confirmation notices, brochures, promotional offers, diagrams, maps or any other faxable document.

Likewise, callers can instruct the voice processor to fax a copy of a particular document to all the parties on a distribution list using a fax broadcasting application. Lastly, callers can use a fax mail application to redirect a fax message to a designated fax machine.

Vendors, such as Comverse Technology, VMX, AT&T and Digital Sound have added the enabling fax and modem circuit cards, upgraded operating system and fax-related application development software to their platforms, essentially as new modular components. It is also possible to upgrade some existing systems from these vendors by purchasing these components separately.

For example, VMX's integrated Fax Mail Plus offering includes an integral Fax Application Processor (FAP) module that supports as many as eight fax ports. This module can be installed in any unoccupied slot in the VMX 200 or VMX 300 system cabinet. The VMX 200 can support as many as three FAPs, while the VMX 300 can handle as many as six.

Add to this an updated operating system and application software--D.I.A.L. Software Release 7, and Fax Mail Plus, in VMX's case-and fax mail integration, fax overflow management and limited fax-on-demand features are deliverable. For full-featured fax-on-demand applications, VMX offers FaxAccess, a dedicated fax-response application software package.

By contrast, Octel adds fax processing to its voice processor with a proprietary adjunct processor called the Voice Information Processing Server. Consisting of a separate voice processing and fax/data module communicating to the central cabinet via Octel's Command Language over X.25, this enhancement provides for both voice response and fax processing capabilities on current Octel systems.

In addition, Octel's Powercall Session--a collection of voice response and fax software applications written for the server--is required to deliver these new features. For custom tailoring of PowerCall Session applications, Octel offers end users TransAct--a proprietary menu-driven application generator package.

TransAct personalizes PowerCall Session for individual departments and user groups, and runs on MS-DOS-based PCs. TransAct allows users to write scripts, gather information and perform there necessary set up tasks using simple fill-in-the-blank screens, menus and context-sensitive help messages.
The logic of this voice/fax integration trend is compelling. Voice processing, with its natural user interface push-button keypad empowerment, provides a perfect front-end to fax processing applications by delivering ease-of-use and flexibility to the process.

Some of the benefits include the ability to select a variety of documents from voice menus and choose transmission options, such as time of delivery, receiving fax machine, and standard or fine resolution. Other major benefits are the ability to append voice messages onto fax message notifications and to transfer to other voice processing applications on the same call, such as leaving voice messages or transferring to an extension via automated attendant.

It's important to know there are some limitations to integrated voice/fax processing compared to dedicated fax servers. In general, integrated platforms cannot support the high capacities--including the number of pages of fax documents that can be stored on the system, the number of faxports and the size of distribution lists--that dedicated fax servers can.

The reason is partly due to the limited amount of available real-estate on the voice processing platform; disk drives, fax/modem circuit cards and memory modules all take up space. In addition, the voice platform must dedicate processing power to other applications.

Generally, voice processors that provide fax functions through a tight connection with a fax server--either their own make or from a third-party--will do a better job at providing fax applications able to support large numbers of users, such as required by fax service bureaus and certain promotional and marketing applications that attempt to serve thousands of people.

E-MAIL INTEGRATION

Even E-mail is getting integrated into voice processors. A good example of this trend comes from VMX. In a laboratory setting, VMX's integrated voice processing systems can be enhanced with specialized software and various enabling add-on fax and text-to-speech circuit cards to provide integrated E-mail message notification, text-to-**speech**, **speech recognition** , fax mail, fax broadcasting and fax-on-demand capabilities.

The VMX system can use text-to-speech to read an E-mail message to a caller who can then output that message to a fax machine. The addition of fax to an E-mail application offers an obvious and immediate benefit: E-mail messages can be delivered to any fax machine anywhere, a boon to end users on the road.

A more mundane and market-ready example of E-mail integration is offered by VMX's new e-Mailworks, a $15,000 prepackaged software product that provides cross-notification of voice and E-mail messages to users who subscribe to both types of messaging systems. Users are given header information about each new message and can hear E-mail message information from a mixed-media mailbox as well as see voice mail message information from the E-mail mailbox. e-Mailworks runs on VMX's D.I.A.L., VMX 200 and VMX 300 systems. It provides integration with DEC's All-in-1, as well as IBM's Professional Office System and Office Vision E-mail systems.

IN USE

Some call it multimedia. Others call it mixed-media or integrated messaging. Whatever it's called, it's abundantly clear that voice mail has become just one aspect of a much broader system architecture--one that can support multiple voice, data and imaging capabilities as users look for systems to help them manage and consolidate disparate message mediums.

This trend toward integration involves marrying voice processing systems with associated voice processing and communication technologies, such as voice response, fax and E-mail.

One example of this trend comes from AT&T's Global Business Communications Systems' Conversant Voice Information System, which is being offered as a multiapplication platform incorporating the company's voice response system and Audix Voice Power voice mail system as a single unit. Other functions available on the system include fax processing supported by the addition of a special fax interface module, **speech recognition** and text-to-speech.

Pier 1 Imports, a specialty retailer of decorative home furniture and clothing headquartered in Fort Worth, Texas, uses the Conversant Voice Information System to help customers find the nearest of its more than 700 locations in the U.S. The company's automated store locator service uses **speech recognition** to let callers use their voices to request the location of the store nearest them and fill out credit applications. The system can support up to 96 ports and 36 hours of voice storage on a PC-based platform enhanced with a passive backplane and dual-bus architecture that expands normal system capacity by providing more slots. It offers all three flavors of fax processing and a ScriptBuilder application generator as a $6,000 option.
The system handles nearly 4,000 calls a week, and the company has added a number of other applications. "We bought the Conversant system for the locator service and subsequently developed many other applications," says Travis Cook, Pier 1's manager of corporate telecommunications.

Ease of programming was a big plus for Pier 1. "Once the core application is set up, which in my case paid for the system, everything else is just a bonus," Cook says. "For example, the Conversant provides a voice listing of available jobs, which eliminated tedious work for the human resources staff. The system is also used for callrouting. And we are developing another application for human resources that will involve text-to-speech technology."

The new application, Cook says, will make it easier to hand out employee references. "Because we hire many college students and part-time workers, we have more than 10,000 employee records," he says. "Other companies that want job references will be able to key in the individual's social security number, and the text-to-speech system will read back the employee name, date employed and date departed."

At Blue Shield of California, a VMX 300 system is employed for voice mail, call routing and a number of IVR applications, including eligibility verification and claims processing running off an IBM 3270 mainframe.

The VMX 300 was picked for its quality, scalability and migration-related considerations, says Fred Mann, telecom coordinator for Blue Shield's Fulsom campus.

"The fact that VMX professed to be developing advanced capabilities like fax and E-mail integration was a major reason the system was purchased," Mann explains. "Although we're not using these capabilities right now, it's good to know they are available. Right now, we're taking a hard look at electronic claims processing with Electronic Data Systems. If that doesn't get off the ground, we just might look at fax-on-demand as a way to provide this application."

Alison Schrupp, manager of Blue Shield's Managed Care Center, which is responsible for HMO claims processing and customer service, doesn't want to wait. "With our eligibility verification application, many of our 1,400 daily callers still want a fax confirmation of their eligibility, even though they get a verbal confirmation from the system," she says.

"The current problem for us is that users get their verbal confirmation through the system, but then they press '0' on their keypad to get to a representative to get the fax confirmation," Schrupp continues." In essence, we end up handling that inquiry twice. An integrated fax application would help us a great deal, and I could easily quantify that. If I had the budget, I'd buy it tomorrow."

With such trends surfacing, it's evident that the border between the telephone-and computer-based worlds is bluring, and that any distinction between them is temporary.

From the voice/fax processing perspective, there is a clear path of migration from voice-only interfaces to a more mixed-bag approach, with the computer--oftentimes a PC--playing the luggage rack.

The implications of this are tantalizing, to say the least. Business communications could be transformed by ubiquitous multiwindowed videoconferencing and drastically simplified access to all types of information-competitive and otherwise. It truly is a brave new world.

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